CLAIMS

What is claimed is:

1. A method of monitoring a polyolefin production process, comprising:

placing a spectroscopic probe into a conduit of a polyolefin production system, having conduit contents that comprise at least one of a feedstock, a feed stream, a reactor discharge, a recovered component, a purified component, a polymer fluff, an extruder feed, and a polymer pellet stream;

exposing the conduit contents to a radiation emission from the spectroscopic probe;

acquiring a spectroscopic signal in substantially real-time from the conduit contents in response to the radiation emission via the spectroscopic probe;

analyzing the spectroscopic signal to determine at least one property of interest of a component of the conduit contents.

2. The method as recited in claim 1, wherein the spectroscopic probe comprises a Raman probe.

3. The method as recited in claim 1, wherein the feedstock comprises at least one olefin monomer.

4. The method as recited in claim 1, wherein the feed stream comprises at least one of an olefin monomer, a comonomer, a chain transfer agent, a diluent, a catalyst, a co-catalyst, and an additive.

5. The method as recited in claim 1, wherein the reactor discharge comprises at least one of the polymer fluff, an olefin monomer, a comonomer, a catalyst, and a diluent.

6. The method as recited in claim 1, wherein at least one of the recovered component and the purified component comprise at least one of an olefin monomer, a comonomer, a catalyst, and a diluent.

7. The method as recited in claim 1, wherein the polymer fluff comprises a polymer fluff blend.

8. The method as recited in claim 1, wherein the polymer pellet stream comprises a mixture of polymer pellets.

9. The method as recited in claim 1, wherein the extruder feed comprises at least one of the polymer fluff, an additive, and a peroxide.

10. The method as recited in claim 1, wherein the property of interest comprises a chemical concentration of the component.

11. The method as recited in claim 1, wherein analyzing the spectroscopic signal comprises analyzing the spectroscopic signal using one or more chemometric models and the property of interest comprises a percent solids, a mechanical property, a chemical property, a rheological property, and a thermal property of the component.

12. The method as recited in claim 1, further comprising adjusting the composition of the conduit contents in response to the property of interest.

13. The method as recited in claim 1, further comprising adjusting the operation of at least one of a reactor feed system, polymerization reactor system, a monomer recovery system, an extruder feed system, and an extruder pelletizer in response to the property of interest.

14. The method as recited in claim 1, further comprising adjusting a product shipment in response to the property of interest.

15. A computer program, provided on one or more computer readable media, for monitoring a polyolefin production process, comprising:

a routine for acquiring a spectroscopic signal in substantially real-time from a spectroscopic probe situated in a conduit of a polyolefin production system, wherein the conduit contents comprise at least one of a feedstock, a feed stream, a reactor discharge, a recovered component, a purified component, a polymer fluff, an extruder feed, and a polymer pellet stream;

a routine for analyzing the spectroscopic signal to determine at least one property of interest of a component of the conduit contents.

16. The computer program as recited in claim 15, further comprising:

a routine for adjusting the composition of the conduit contents in response to the property of interest.

17. The computer program as recited in claim 15, wherein the spectroscopic probe comprises a Raman probe and the spectroscopic signal comprises a Raman spectrum.

18. The computer program as recited in claim 15, wherein the feedstock comprises at least one olefin monomer.

19. The computer program as recited in claim 15, wherein the feed stream comprises at least one of an olefin monomer, a comonomer, a chain transfer agent, a diluent, a catalyst, a co-catalyst, and an additive.

20. The computer program as recited in claim 15, wherein the reactor discharge comprises at least one of the polymer fluff, an olefin monomer, a comonomer, a catalyst, and a diluent.

21. The computer program as recited in claim 15, wherein the at least one of the recovered component and the purified component comprise at least one of an olefin monomer, a comonomer, a catalyst, and a diluent.

22. The computer program as recited in claim 15, wherein the polymer fluff comprises a polymer fluff blend.

23. The computer program as recited in claim 15, wherein the polymer pellet stream comprises a mixture of polymer pellets.

24. The computer program as recited in claim 15, wherein the extruder feed comprises at least one of the polymer fluff, an additive, and a peroxide.

25. The computer program as recited in claim 15, wherein the property of interest comprises a chemical concentration of the component.

26. The computer program as recited in claim 15, wherein the routine for analyzing the spectroscopic signal analyzes the spectroscopic signal using one or more chemometric models and the property of interest comprises a percent solids, a mechanical property, a chemical property, a rheological property, and a thermal property of the component.

27. The computer program as recited in claim 15, further comprising a routine for adjusting the operation of at least one of a reactor feed system, polymerization reactor system, a monomer recovery system, an extruder feed system, and an extruder pelletizer in response to the property of interest.

28. The computer program as recited in claim 15, further comprising a routine for adjusting a product shipment in response to the property of interest.

29. A polyolefin production system, comprising:

a reactor feed system configured to receive one or more feedstocks via a first set of conduits and to output one or more feedstreams via a second set of conduits;

a polymerization reactor system configured to receive the one or more feedstreams via the second set of conduits and to output a reactor discharge via a third set of conduits;

a monomer recovery system configured to receive the reactor discharge via the third set of conduits and to output one or more recovered components via a fourth set of conduits and a polymer fluff via a fifth set of conduits; and

one or more spectroscopic probes situated in at least one of the first, second, third, and fourth set conduits configured to acquire a spectroscopic signal in substantially real time.

30. The polyolefin production system as recited in claim 29, wherein the one or more spectroscopic probe comprise Raman probes.

31. The polyolefin production system as recited in claim 29, wherein the one or more feedstocks comprise at least one olefin monomer.

32. The polyolefin production system as recited in claim 29, wherein the one or more feedstreams comprise at least one of an olefin monomer, a comonomer, a chain transfer agent, a diluent, a catalyst, a co-catalyst, and an additive.

33. The polyolefin production system as recited in claim 29, wherein the reactor discharge comprises at least one of the polymer fluff, an olefin monomer, a comonomer, a catalyst, and a diluent.

34. The polyolefin production system as recited in claim 29, wherein the one or more recovered components comprise at least one of an olefin monomer, a comonomer, a catalyst, and a diluent.

35. The polyolefin production system as recited in claim 29, wherein the polymer fluff comprises a polymer fluff blend.